



# LA3335M

## PLL FM Multiplex Demodulator for 3 V Headphone Stereos and Radio-cassette Recorders

### Overview

The LA3335M is PLL FM stereo multiplex demodulator IC designed for use in headphone stereos, etc. which operate from a low supply voltage.

### Applications

- FM Multiplex IC for 3 V headphones, radio-cassette recorders

### Functions

- PLL FM stereo decoder, VCO stop, stereo indicator

### Features

- Wide operating voltage range : 1.8 to 6 V
- Low current dissipation : 1.6 mA
- Minimum number of external parts required

### Specifications

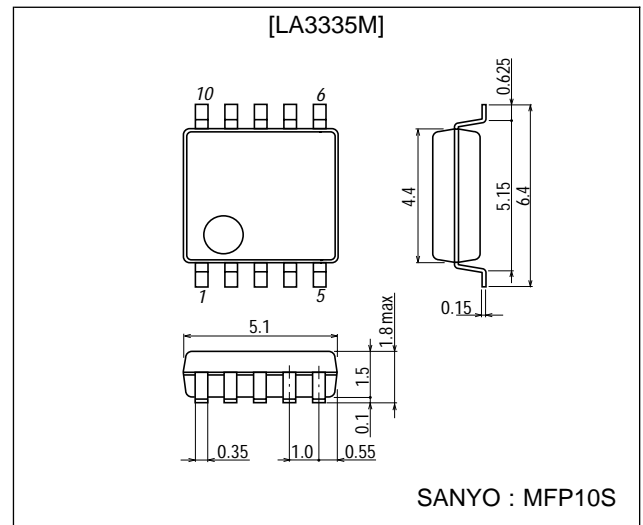
#### Maximum Ratings at $T_a = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\text{ max}}$		8	V
Lamp drive current	$I_L\text{ max}$		10	mA
Allowable power dissipation	$P_d\text{ max}$	$T_a \leq 70\text{ }^\circ\text{C}$	50	mW
Operating temperature	$T_{opr}$		-20 to +70	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

### Package Dimensions

unit : mm

#### 3086A-MFP10S



#### Operating Conditions at $T_a = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		3	V
Operating voltage range	$V_{CC\text{ op}}$		1.8 to 6	V
Input signal voltage	$V_{IN}$		150	mV

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TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

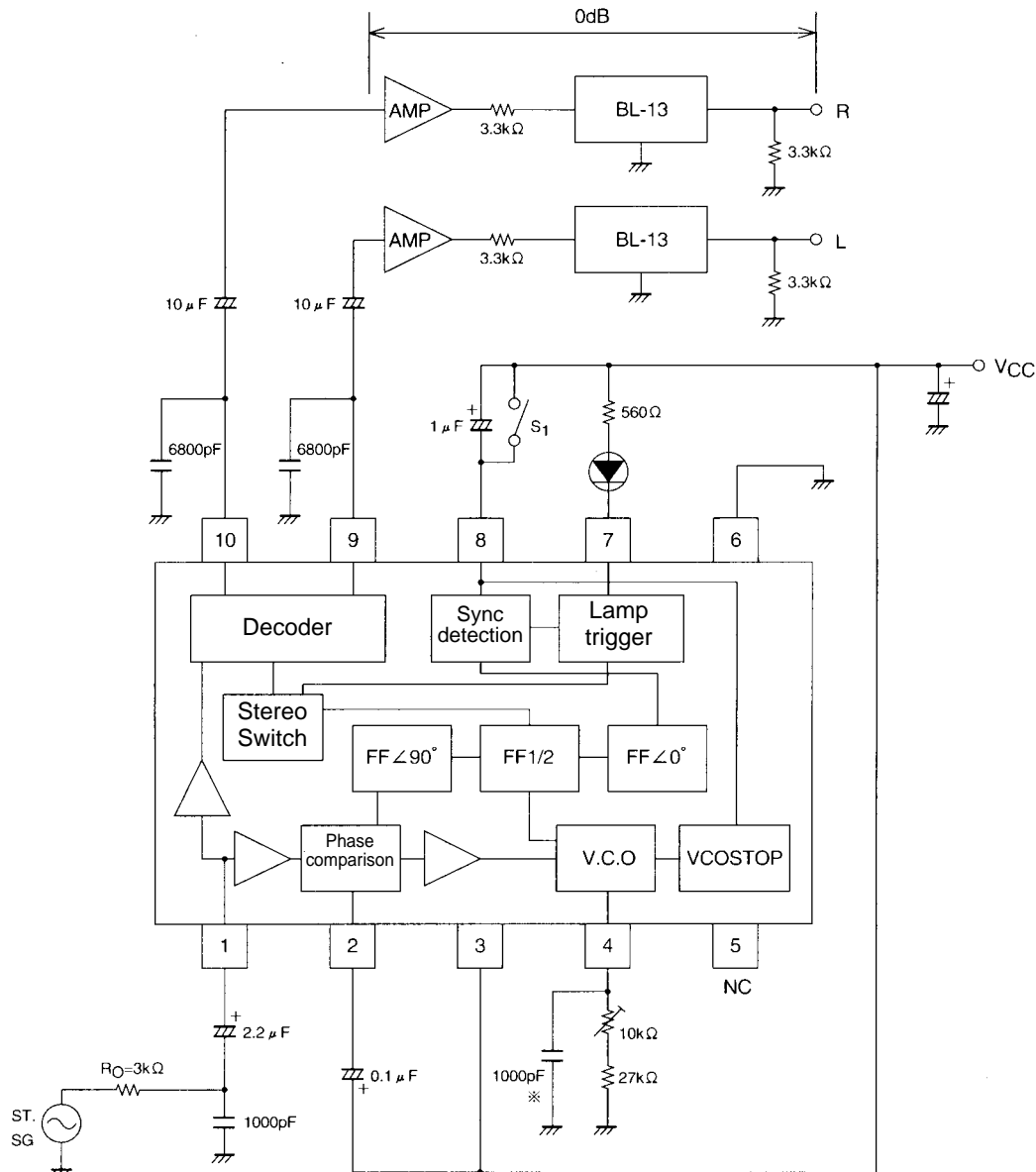
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**Operating Characteristics at  $T_a = 25\text{ }^\circ\text{C}$ ,  $V_{CC} = 3\text{ V}$ , input  $150\text{ mV}$ ,  $L + R = 90\%$ , pilot =  $10\%$ ,  $f = 1\text{ kHz}$ , See specified Test Circuit.**

Parameter	Symbol	Conditions	min	typ	max	Unit
Quiescent current	$I_{CCO}$	No input		1.6	2.5	mA
Input resistance	$R_i$		35	50	65	$k\Omega$
Output resistance	$R_o$		5.3	7.5	9.7	$k\Omega$
Channel separation	CHsep		30	45		dB
Total harmonic distortion	THD	Monaural		0.6	1.5	%
		Stereo main		0.3	1.5	%
Output voltage	$V_O$	Monaural	90	130	180	mV
Channel balance	CB	Monaural		0	1.5	dB
Lamp lighting level	$V_L$	Pilot	1.5	3.5	6	mV
Lamp hysteresis	hy			3.5		dB
Capture range	CR	Pilot 15 mV		$\pm 3$		%
Allowable input level	$V_{IN\text{ max}}$	Monaural, THD = 5%		350		mV
Signal to noise ratio	S/N	Monaural		82		dB

## Equivalent Circuit Block Diagram and Test Circuit



S1: VCO STOP when ON

AMP: Bandwidth of 100 kHz or more, THD = 0.01% or less, input impedance of 330 kΩ or more

\* Styrol capacitor


A06081

## LA3335M

### External Parts

Part Name	Symbol	Kind	Value	Remarks
Resistor	R1	Carbon resistor	27 k $\Omega$	VCO time constant
	R2	Carbon resistor	560 $\Omega$	Limiting resistor
Semifixed resistor	VR1	Carbon resistor	10 k $\Omega$	VCO OSC frequency adjust
Capacitor	C1	Electrolytic capacitor	2.2 $\mu$ F	DC blocking
	C2	Electrolytic capacitor	0.1 $\mu$ F	Loop filter
	C3	Polystyrol capacitor	1000 pF	VCO time constant
	C4	Electrolytic capacitor	1 $\mu$ F	Pilot detection
	C5	Ceramic capacitor	6800 pF	De-emphasis
	C6	Ceramic capacitor	6800 pF	De-emphasis
	C7	Electrolytic capacitor		Power supply ripple filter

### Typical Voltage and Name of Each Pin

Pin No.	Voltage	Name	Remarks
1	1.2 V	Input	
2	$V_{CC}-0.7$ V	PLL loop filter	
3	$V_{CC}$	Power supply	
4	—	VCO	 $V_{CC}-0.2$ V $0.65 V_{CC}$
5	—	NC	
6	0 V	GND	
7	—	Stereo indicator	Open collector
8	$V_{CC}-0.7$ V	Pilot sync detection filter	
9	1.3 V	Decoder output (low)	
10	1.3 V	Decoder output (high)	

### Proper cares in using IC

1. VCO stop method  
Short pin 7 and pin 3 ( $V_{CC}$  pin) to stop the VCO.  
(Note) The maximum voltage to be applied to pin 7 must not exceed the voltage on pin 3.
2. Free-running frequency check method : Use either of the following two methods.
  - a) Connect pin 4 to a frequency counter through the high input impedance amplifier.

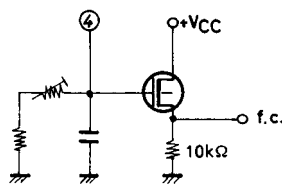


Figure 1

- b) Connect the connection point of the semifixed resistor connected to pin 4 and the fixed resistor to a frequency counter through the  $R_X$  of 240 k $\Omega$ . Fig. 2 shows how the error changes as the  $R_X$  value is decreased.

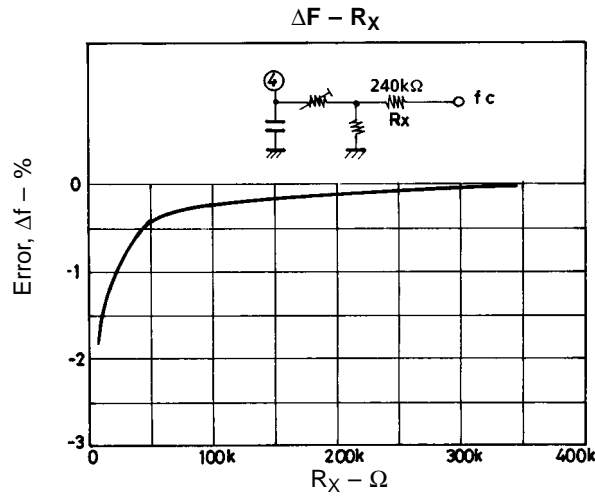


Figure 2

3. Separation setting method

The LA3335M is so designed that the sub-signal gain is approximately 1.25 times as high as the main signal gain. The separation can be set by attenuating the sub-signal of the FM detection output. (See Figure 3)

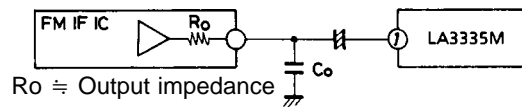


Figure 3

The value of capacitor  $C_o$  depends on the attenuation of the sub-signal of the FM detection output and the IF IC output impedance  $R_o$ . Fig. 4 shows the value of separation setting capacitor  $C_o$  when  $R_o$  is set to 3 k $\Omega$ .

For example, when the attenuation of sub-signal of the IF IC output is 0.9 time that of the main signal, it is seen from Figure 4 that the value of  $C_o$  is approximately 500 pF.

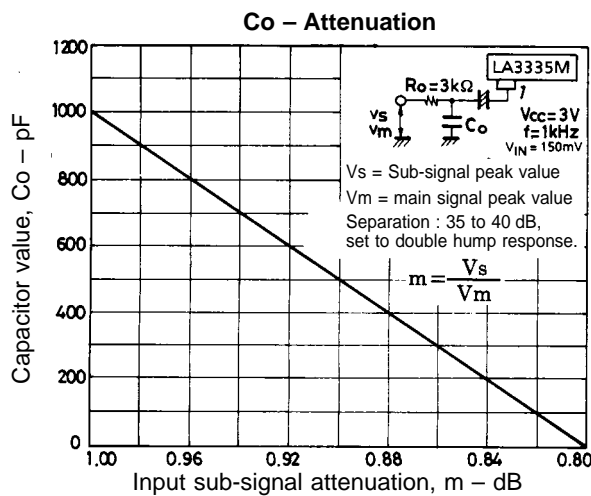
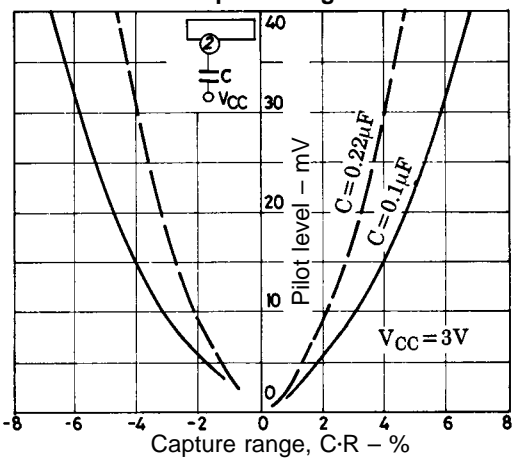
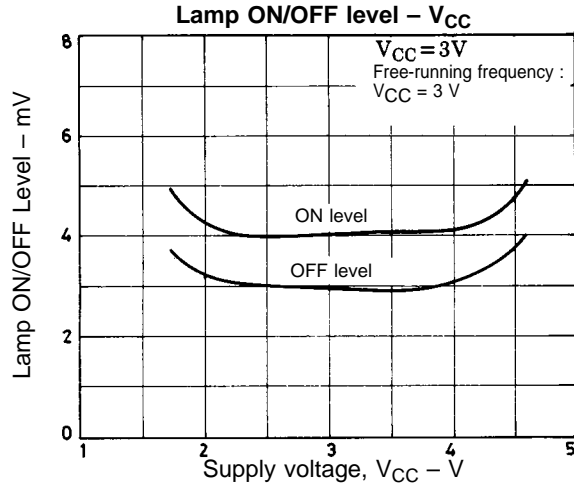
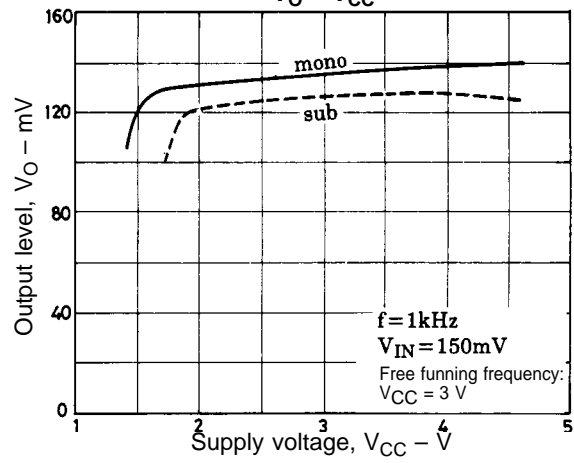
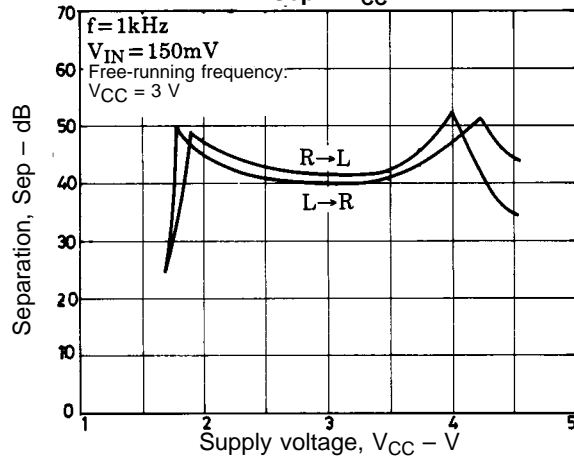
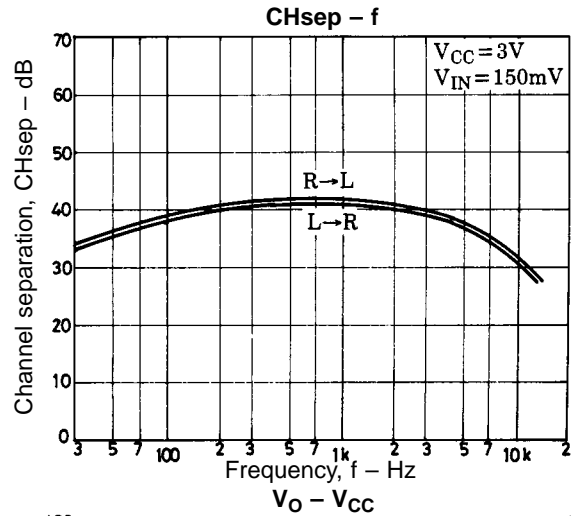
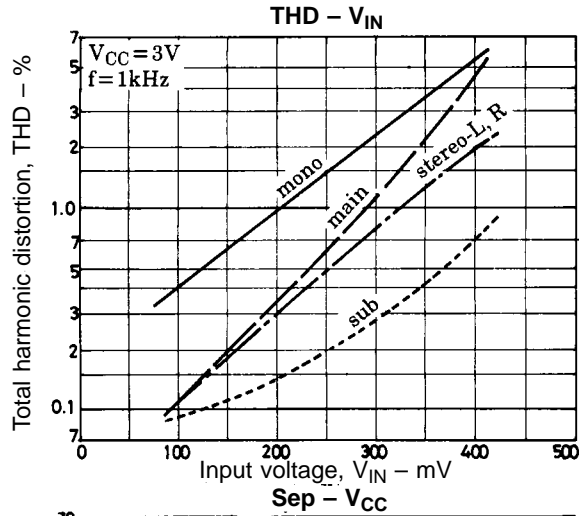
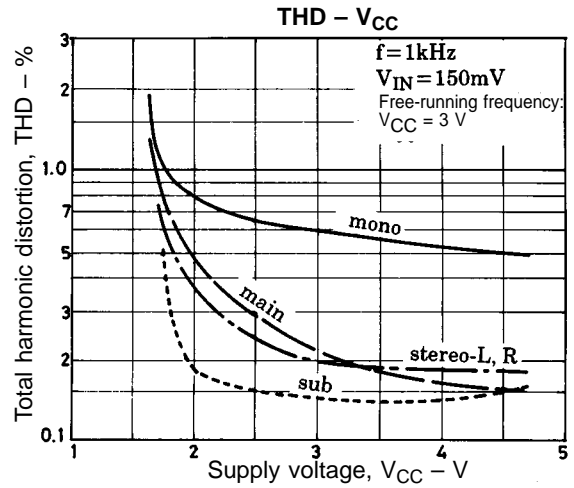
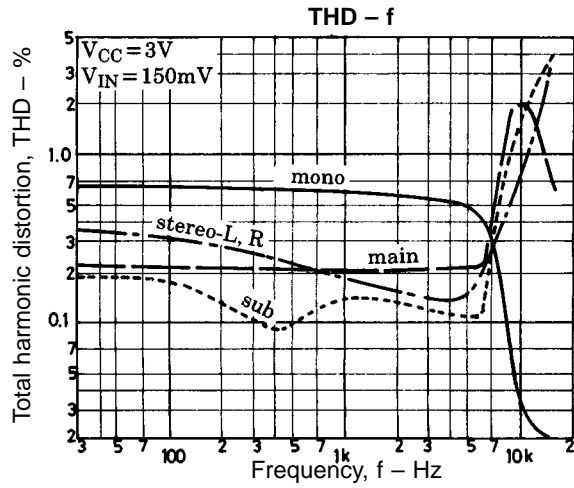
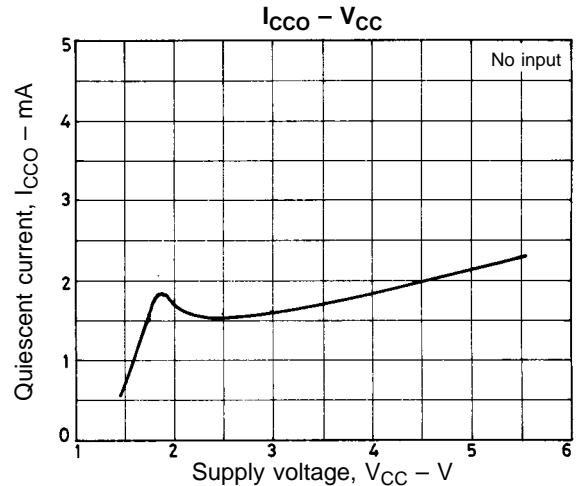
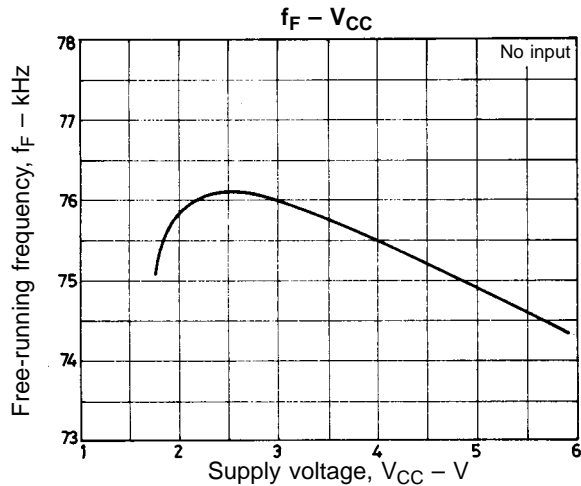


Figure 4





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